# 6.829 Computer Networks
# Problem set 2

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## 1 Measurements

Figure 1 shows the performance of a protocol with a fixed window size. The best score we were able to achieve was -4.5 log(Throughput/Delay) with a window size of 15. However, the measurements were not very stable and varied by as much as 0.1 between different runs with the same window size.

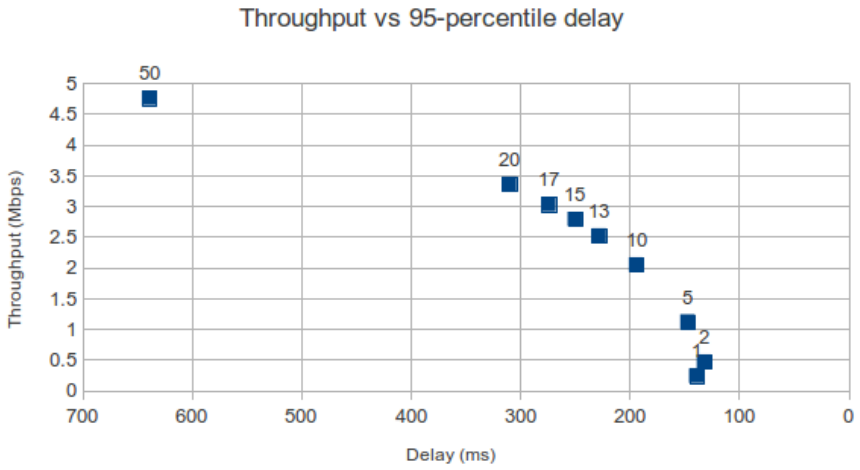


Figure 1: Throughput vs 95-percentile delay with a fixed window size

Our first try to implement an AIMD scheme did not produce very good results; we got -5.84 log(Throughput/Delay) when adding $1/w$ to the window size on every ACK and dividing by 2 on every timeout (timeout set to 1000 ms). A slower increase of $1/w^2$ improved the score to -4.72. Another approach we tried was to change the timeout, where we found out that decreasing the timeout to 100 ms improves the score to -5.28 (while maintaining the standard AIMD). By combining both approaches we managed to improve the score up to -4.12, by using a timeout of 100 ms, an additive increase of $1/w^2$ on every ACK, and a harsher decrease of $w \leftarrow \sqrt{w}$ on every timeout.

The delay-triggered scheme proved to be competitive with AIMD. We experimented with changing the window size based on when the RTT crosses a given threshold. Table 1 summarizes the results. The best score of -4.16 was achieved with a threshold of 100 ms, an increase of 0.1,[1] and a decrease of 1.

| Threshold (ms) | Increase | Decrease | Delay (ms) | Throughput (Mbps) | Score |
|---|---|---|---|---|---|
| 100 | 1 | 1 | 308 | 3.39 | -4.51 |
| 200 | 1 | 1 | 580 | 4.02 | -4.97 |
| 50 | 1 | 1 | 162 | 1.75 | -4.53 |
| 100 | 2 | 2 | 436 | 3.76 | -4.75 |
| 100 | 1 | 2 | 299 | 3.12 | -4.56 |
| 100 | 0.1 | 1 | 155 | 2.41 | -4.16 |

Table 1: Delay, throughput, and log(Throughput/Delay) score with different delay-triggered schemes.

[1] A non-integer increase effectively means that the window size changes only when it reaches the following integer